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United States Environmental Protection Agency
Region 2
290 Broadway
New York, New York 10007-1866

Attn: Mr. Ricardito Vargas, Project Manager

Subject: Response to USEPA's March 1, 2019 Comment Letter
Supplemental Field Sampling and Analysis Plan
Arthur Kill, Spa Spring Creek and Woodbridge Creek
Former Chevron Perth Amboy Facility
1200 Maurer Road, Perth Amboy – Middlesex County
Facility EPA ID #: NJD081982902
TRC Project No. 326731/890

Dear Mr. Vargas:

On behalf of Chevron Environmental Management Company (Chevron) TRC Companies, Inc. (TRC) has prepared the enclosed response to the United States Environmental Protection Agency's (USEPA) March 1, 2019 comments regarding the November 19, 2018 Supplemental Field Sampling and Analysis Plan (SFSAP) prepared for the above-referenced Chevron Facility (the Facility). The SFSAP proposed collection and analysis of sediment samples from Spa Spring Creek, Woodbridge Creek, and the Arthur Kill, all adjacent to the Facility. As described further, the attached, revised SFSAP addresses the USEPA's written comments, as well as those discussed and agreed upon during the September 17, 2018 meeting between Chevron, TRC, and representatives of the USEPA and the New Jersey Department of Environmental Protection (NJDEP). The USEPA's March 1, 2019 letter included 12 comments in response to the SFSAP, which was submitted by Chevron along with responses to the USEPA's August 13, 2018 letter concerning the three waterbodies to be sampled in accordance with the SFSAP. Several of the USEPA's comments described the need for additional information and/or provision of historical data, much of which was provided in earlier documents. Therefore, this letter and the attached, revised SFSAP are provided to the USEPA for their information to assist with their review and aid in an expedited approval. It should be noted that the SFSAP and antecedent documents and reports prepared and implemented over the course of the project have been reviewed by the USEPA and NJDEP and modified as needed. The objective of the SFSAP is to complete the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) of water bodies as specified in the 2013 Hazardous and Solid Waste Amendment (HSWA) permit renewal and Permit Modifications I.

Contaminants of concern (COCs) exist in the soft sediments overlying the more competent glacial till in the waterways adjacent to the Facility. Based on the existing data and information, the contaminants in the soft sediments have been characterized in the waterbodies around the Facility (Spa Spring Creek, Woodbridge Creek, and Arthur Kill). Delineation is based in part on physical limits of waterbodies and the edge of the scarp forming the end of soft sediments in the channel of the Arthur Kill as determined through a bathymetric survey and bank-to-bank sampling along sediment transects. The sampling, laboratory analysis, and physical/bathymetric survey activities implemented to characterize and delineate the soft sediment was documented in prior reports that were reviewed by both the USEPA and NJDEP. The proposed sediment sampling is intended to address the limited data gaps identified during the September 17, 2018 meeting, and in the March 1, 2019 USEPA comments.

As discussed and agreed upon in prior correspondence and at the September 2018 meeting, and memorialized in the November 2018 response to comments letter to the USEPA; terrestrial areas within 200 feet of the waterways (i.e., the shoreline Solid Waste Management Units [SWMUs], Areas of Concern [AOC]), and areas of Light Non-Aqueous Phase Liquid (LNAPL) were evaluated with respect to potential effects on adjacent waterways by the Baseline Ecological Evaluation (BEE) included in the 2003 RFI Report, and in the November 2016 Supplemental Ecological Evaluation Report (SEER). Historic migration pathways were also evaluated in prior RFI Reports, quarterly progress reports, and the numerous monitoring reports.

Given the above and with respect to the USEPA's current requests, Chevron has provided relevant information to address each of the USEPA's 12 comments from the March 1, 2019 letter. The USEPA's comments are provided below in their entirety, followed by Chevron's responses. The Tables, Attachments, Figures and Appendices referred in this letter are appended to the attached, revised SFSAP unless noted otherwise. Chevron believes that the information provided in this letter and in the revised SFSAP provide the technical information and a historical context to address the USEPA's comments concerning the proposed sediment sampling and enable an expedited approval of the SFSAP. Once approved, Chevron will expeditiously implement the field work and provide a comprehensive report integrating the results of all prior surface water investigations in a complete and final RFI report.

USEPA Comment 1. Section 1.0 Introduction, Page 1, 3rd paragraph: The document states, "The facility has completed several phases of the RCRA Facilities Investigation (RFI) for the three surface water bodies ..." However, the historical data is not included in this document, as such it is unclear if the proposed sampling locations and intervals are sufficient. The document should be revised to include a more detailed discussion of sampling results (text, figure, table) from prior investigations so that we can evaluate if the proposed locations are adequate to sufficiently delineate the nature and extent of contamination in the waterbodies and along the adjacent shorelines.

Response 1: As indicated above, the proposed sediment samples and intervals are based on several rounds of sampling, analysis, report submissions, and review by the NJDEP/USEPA. Therefore, Chevron believes the basis for the proposed sampling is consistent with the objectives of the sampling program as determined and reviewed by the agencies.

Laboratory data associated with previous submissions was provided in prior documents submitted to USEPA and NJDEP. Revised Figure 2 of the SFSAP, and Figure 2a of the SFSAP are attached to show the location of all existing and proposed sediment samples. Figure 2a is a Facility plan showing the relevant SWMUs/AOCs/PAOCs, historical and current extents of LNAPL areas, existing Facility features, and historical and proposed sediment sample locations. Revised Table 1 of the SFSAP is included to describe the relationship between proposed sample locations and the SWMUs and other features of concern. Attachment 1 includes the November 2016 Supplemental Ecological Evaluation Report (SEER), which provides all data and information related to the investigation of the adjacent waterways completed in 2014 (e.g., SEER Figures 3, 4, and 5). Sediment sample locations are shown with respect to the SWMUs and AOCs at the Facility on the drawing titled Sediment Sample Location Plan - 2002 and 2014 Sampling Events with Siting Explanation (Figure 5). This drawing highlights the relationship between SWMUs/AOCs/PAOCs, discharge areas, and sediment sample locations, and includes explanatory notes regarding sample locations. Historical data tables comparing sediment and surface water sample analytical results to the NJDEP's Ecological Screening Criteria (ESCs) for sediments are provided in Section 4 of the SEER.

USEPA Comment 2. Section 1.0 Introduction, Page 3: The document states, "As part of the Supplemental EE, Chevron ...further evaluated potential contaminant migration pathways to surface water." However, limited information on this evaluation was included in this document as such we are unable to determine if the proposed sampling program is adequate. The document, as well as Figure 2, should be revised to discuss, at length, any AOCs/SWMUs/PAOCs with the potential to impact these waterbodies, including but not limited to: SWMUs 1, 2, 3, 7, 8, 24, 26, 31, 35, 36, 40, 41, 45, etc. This figure should also show the former confluence of historic Spa Spring Creek with Woodbridge Creek and areas where non-point source discharges over the Facility's operation history may have occurred via sheet runoff or groundwater discharges, and/or were associated with overwater fuel transfers, former dock/pier operations, etc. Additionally, this figure should indicate the location of shoreline/perimeter soil borings where light non-aqueous phase liquid (LNAPL) was detected, as referenced below in Comment No. 9. The above information is necessary to determine if the proposed sampling program is adequate.

Response 2: As noted in Response 1, Figure 2a of the attached SFSAP is provided to show the former AOCs/SWMUs/PAOCs noted by USEPA in Comment 2, above, and historical features such as docking and product inbounding areas. Information on the management and other activities

conducted in the AOCs/SWMUs/PAOCs was provided to the USEPA in the Description of Current Conditions Report prepared by Environmental Science and Engineering, Inc. August 24, 1994 (DOCC). The text of the DOCC through Section 3 is included as Attachment 2 and provides information on historic practices in these areas. The basis for the proposed sediment sample locations is provided on revised Table 1, and on Figure 3. Relevant portions of the DOCC are summarized in Section 1.1.3 of the attached revised SFSAP. The summary includes the location of know historic discharge location and wastewater management areas.

Sediment samples were collected in the 2002 and 2014 investigations of adjacent waterways to evaluate Contaminants of Potential Ecological Concern (COPECs) in sediments that may have been related to the historical operations at the Facility (waste storage, product transfer, etc.). Chevron believes that the historical and proposed sample quantity and locations are adequate with respect to characterizing sediment near these former operational areas. In addition, the frequency of historic and proposed sampling is sufficient to assess potential effects of non-point source discharges, e.g., runoff and groundwater flow to surface water bodies. For reference, the extent of LNAPL areas in terrestrial SWMUs/AOCs proximal to the shoreline is presented on Figure 2a. The LNAPL areas were previously defined, are currently undergoing remediation, and as stated in the 2003 BEE, "Pathways for contaminant migration from SWMUs and AOCs to environmentally sensitive natural resources do not appear to be complete." Tables comparing analytical data from creek sediments with data for terrestrial soils of the SWMUs/AOCs and respective ESCs indicate that there are no data gaps regarding analytical parameters (Section 4 of the SEER [Attachment 1]). Historical information on Facility conditions, LNAPL monitoring and attenuation, Sections 7 and 9 of the 2003 RFI (LNAPL and BEE sections), and historical aerial photographs (1978) are included in Appendix B; this information is being re-submitted to expedite USEPA's review.

USEPA Comment 3. Section 1.0 Introduction, Page 3: The document states, "Historically, the Facility has discharged treated storm water and waste waters to outfalls located in Spa Spring Creek and Woodbridge Creek." However, limited additional information on these historic outfalls is included in this document. The document should be revised to include text and accompanying figures detailing the location of known and historic tidal creeks, outfalls, and other current and former discharge (permitted and unpermitted) points into Woodbridge Creek, Spa Spring Creek, and the Arthur Kill; including those referenced in Attachment 3 (DSN 0004A, 004B, 004C, 005, 005A, 006A, etc.). The document should be revised to discuss waste management practices prior to 1974 (date of initial Federal NPDES permit), prior to city sewer connections, and identify historic direct discharges of industrial waste into the three waterbodies. Chevron is directed to a historic document by the Interstate Sanitation Commission Report, entitled Location of City Sewers Adjacent to Industrial Plants Bordering the Arthur Kill in New Jersey, dated January 1965, which discusses the direct discharge of waste material into Woodbridge Creek and the Arthur Kill from the

former California Oil Company (electronic pages 13, 14, 62) and other facilities. The document is available at:

http://www.iec-nynjct.org/sites/default/files/2018-08/965%20Sewers%20Locations%20Arthur%20Kill%20NJ%20opt.pdf.

Response 3: Figure 2a is included to show the current/former NJPDES outfalls, historical waterway locations, and known points of discharges from the Facility. Information on waste management practices prior to the mid-1970s, while requested by the USEPA, is limited. However, Chevron previously provided the USEPA with a copy of the DOCC which was prepared in accordance with the 2013 RCRA HSWA permit issued by the USEPA. As noted above in Response 2, relevant sections of the DOCC describing SWMUs and AOCs are included as Attachment 2. Section 2 of the DOCC contains information on historic discharges, which are summarized below. Section 1 of the revised SFSAP provides a narrative historical summary of wastewater, stormwater, and process waste management practices, and a brief summary is presented below.

From 1950 to 1976 and before the construction of the Effluent Treatment Plant (ETP), East Yard stormwater and wastewater discharges were to the Arthur Kill via an oil/water separator (identified as SWMU 36). No information is available for pre-1950 wastewater discharge practices or conditions. Other discharges described in the DOCC for the Central Yard, West Yard, Main Yard, and North Field were routed to an Oily Water Sewer System (AOC 16) to several oil/water separators in the North Field, where oil was recovered, and suspended solids settled out prior to discharge. The North Field oil/water separators were used to recover oils and for the collection of settled solids later disposed in SWMU 43 (Mud Flats). These units included:

- Old Pond (SWMU 40) – operated 1940s-1970s
- No. 4 Separator (SWMU 35) – 1950-1977
- Surge Pond (SWMU 2) – 1950-1960; capped and closed 2016
- North Field Basin (SWMU 1) – 1960-2006 (area remedied and restored as a tidal wetland)
- No. 2 and No. 3 Separators – associated with the Surge Pond, included in the ETP (SWMU 31).

The locations of these features are shown on Figure 2a and Figure 3. Figure 3 is a copy of a drawing titled AOC, SWMU, and PAOC Location Map, prepared from a figure of the same name by Parsons that provides the locations and descriptions of AOCs and SWMUs at the Facility, and the extent of LNAPL (also provided with detailed information on LNAPL monitoring in Appendix B-4).

All stormwater and wastewater from 1976 to 1987 was directed to the ETP, with the exception of a small stormwater discharge area draining to Spa Spring Creek. The Old Pond Separator, No. 4 Separator, and Oil/Water Separator for the East Yard were taken out of service after the ETP became operational. The East Yard Basin (SWMU 3) was completed in 1976 and replaced the Oil Water Separator Near East Yard Basin, which include a pumping station to divert oily water to the ETP. The ETP included oil water separation and advance biological treatment and discharged to Woodbridge Creek. Stormwater overloads were held in the North Field Basin from 1960-1976.

Further changes occurred after 1987, including the cessation of stormwater discharges to the North Field Basin and East Yard Basin, as well as cessation of waste sludge placement in the Surge Pond. Stormwater was held in multiple tanks prior to treatment at the ETP.

Chevron believes the historical and proposed samples in the three waterways are sufficient to assess sediment conditions related to historic point and non-point source discharges from plant operations. As noted in the SFSAP and in prior correspondence with the EPA (November 2016 SEER, November 2018 RTC/SFSAP), the historical and recent industrial uses of and contaminant contribution to the Arthur Kill and Woodbridge Creek by multiple entities cannot be understated.

Appendix B-1 is a drawing prepared in January 1993 that identifies the stormwater collection system and connections to the former treatment plant for process and bulk storage tank areas, as well as permitted discharge locations (e.g., DSN004) for non -contact cooling water from the former power plant. The drawing shows that only small and largely undeveloped areas of the Facility contributed runoff to the adjacent waterways.

Chevron reviewed the historic document titled Interstate Sanitation Commission Report (ISCR) via the internet link provided by the USEPA. The ISCR does not provide any further information beyond that in the DOCC and already known and described herein. The ICSR notes that the formerly operational API separators discharged to Woodbridge Creek ("API Separators 1 and 2 and the settling basin lagoon", i.e., the No. 2 and 3 separators and surge pond, now closed) with the East Yard Tank Farm Separator discharging to the Arthur Kill. The ISCR notes that all sanitary wastes were discharged to the 12-inch diameter public sewer on State Street. Maps included in the ISCR do not provide any detail for the Facility. Chevron previously reviewed this ISCR report in 1994 as part of the DOCC Report and discussed its findings previously with the NJDEP and USEPA case team at that time.

USEPA Comment 4. Section 2.1 Sample Collection, Page 5, Table 1 and Figure 2: The document states, "In summary the proposed sample locations were selected to ...revisit previously sampled locations to supplement analysis with shallow and/or deeper samples as well as EPH where it had not previously been analyzed." However, it is unclear if this goal will be achieved since the previous sample locations/intervals were not referenced in the document, in any form, for direct comparison. Further review of the document suggests

that few samples will be collected at depth (greater than 0.5 ft. samples) for any contaminant of concern (COC). The document should be revised to include a table comparing past sampling intervals/depths to those proposed herein, so that we can confirm that the sampling program is adequate to sufficiently delineate the impacts to the waterbodies.

Response 4: The Revised Table 1 provides a comparative summary and the location of proposed and historical samples, depths, and analytical parameters. Regarding the depth of proposed sampling, it should be noted that the biologically active zone, or benthic zone is defined by the NJDEP as 0-0.5 feet and would be of primary concern with respect to sediment impacts. It was also agreed at the September 17, 2018 meeting and in the subsequent November 2018 responses to the USEPA's August 2018 comment letter that further sampling (i.e., of "hotspots") is not necessary to meet the requirements of the 2013 HSWA permit, and that the existing and proposed samples adequately characterize and delineate contaminants in sediment. Further, petroleum constituent analysis (i.e., Volatile Organic Compounds [VOCs]; Base Neutral Compounds [BNs]) has been completed throughout the waterways to various depths in and below the benthic zone. The horizontal, downstream and bank-to-bank physical limit of contaminated sediments in Woodbridge Creek was determined by completing a bathymetric survey and bottom profile analysis. The bathymetric survey revealed a steep submarine escarpment at the Woodbridge Creek/Arthur Kill confluence (Figure 6 of Attachment 1), indicating the terminus of soft sediments at the contact with the Arthur Kill. Therefore, further sampling to define the vertical/horizontal extent of EPH or other contaminants beyond that proposed in the SFSAP is not warranted.

USEPA Comment 5. Section 2.1 Sample Collection, Additional Background Locations Woodbridge Creek, Page 5: In response to concerns that SED-09 was not an appropriate background location, Chevron noted that "eight (8) additional background samples along Woodbridge Creek, in the vicinity of existing background location SED-10 ..." would be collected. While, the 2002 sample results for SED-10 indicated low contamination, a review of Figure 2 suggests that the location is directly beneath a highway overpass which is a potential source of PAHs and inorganics. As referenced in NJDEP' s EETG Section 5.3.4, professional judgement should be used regarding the specific locations of the additional background samples such that obvious sources of contamination unrelated to the Facility should be avoided. Chevron also noted in the Response to Comments (Page 5, Woodbridge Creek Comment No. 1) that "SED-09 transects represents potential off-Facility source conditions." Please note, before we will concur that contamination detected at SED-09 is not Facility related, Chevron must collect sufficient data to support impacts from off-Facility sources as referenced in NJDEP TRSR (N.J.A.C. 7:26E-3.10).

Response 5: The USEPA's suggestion that proposed background samples at SED-10 are inappropriate due to potential roadway runoff contributing PAHs and inorganics does not take into consideration the nature of the surrounding, highly urbanized drainage basin. Urban runoff from the surrounding region is not limited to roadways, and as observed on aerial imagery

(Appendix B-6) multiple industrial, commercial, and residential areas are located directly along or in proximity to the subject waterways upstream of the Facility, including the various urban and industrial land use types identified in the regions based on the NJDEP's GeoWEB database map included in the SFSAP (see Attachment 3-1). Therefore, the presence of COPECs in Woodbridge Creek from regional point and non-point sources represents the background condition of the creek.

The proposed samples at SED-10 are not adjacent to "obvious offsite sources of contamination", such as an industrial outfall or known contaminated area. Further, the SED-10 location was discussed during the September 17, 2018 meeting, and deemed by USEPA as "an area that can potentially be used as background "in their August 31, 2018 comment letter. Sufficient data is available suggesting that the COPECs detected in samples around SED-9 are not Facility-related. Specifically, as shown on Figures 9-7 in Attachment 1, the concentration of COPECs detected in downstream samples at SED-6 are an order of magnitude lower than those at SED-9 (i.e., total PAHS at SED-9-C are 69.85 mg/kg versus those at SED-6-B (0.71 mg/kg). Similarly, low concentrations in Spa Spring Creek indicate that Chevron operations were not a contaminant source in that waterway. This trend from higher to lower concentrations would be reversed were the COPECs at SED-9 related to a Facility discharge. The laboratory analyses for the SED-6, SED-7, and SED-10 samples are consistent with information recorded on their boring logs (Attachment 6) which note the absence of visual or olfactory indication of contamination versus what was described on SED-9 boring logs. Regardless, as noted in the SFSAP and in the November 2018 RTCs, Chevron will add two additional sediment transects between SED-9 and SED-6, each having three sample locations (identified on Figures 2 and 2a in the revised SFSAP as SED-23 A, B, and C; SED-24 A, B, and C). Each sediment sample will be analyzed for the full suite of parameters listed on revised Table 1; a list of proposed sediment samples is also provided on each of these figures.

USEPA Comment 6. Section 2.1 Sample Collection, Data Gaps Woodbridge Creek New Locations, Page 5: The document states, "Chevron will attempt to collect shallow sediment samples between existing transects SED-03 and SED-02. This additional transect is SED-25-A, B, C. The feasibility of completing this transect depends on access approval of the utility owners." Since Figure 2 does not reference the location of the pipelines/utilities, it is difficult to evaluate the issues with this location. Figure 2 should be revised to include the location of the pipeline/utilities and any other obstacles to sampling.

Response 6: Figures 2 and 2a show the location of pipelines/utilities that may obstruct sampling at SED-25. As noted, shallower samples may be collected in these areas using a Ponar dredge or similar low-impact sampler.

USEPA Comment 7. Section 2.1 Sample Collection, Data Gap Samples EPH Analysis at Existing Boring Locations, Page 6: The document states, "Chevron will resample all past locations on Woodbridge Creek and Spa Spring Creek for EPH analysis where EPH was not

analyzed previously." However, a review of the document suggests the proposed additional EPH analysis is generally limited to the shallow 0 to 0.5 ft. interval where analysis was conducted for other COCs. Further review of the available data suggests that collection of subsurface (at-depth) samples were previously limited in scope, such that the majority of samples were not analyzed for extractable petroleum hydrocarbons (EPH) or other COCs below 0 to 0.5 ft. interval including, but not limited to: SED-01 A/B/C; SED-2C, SED-3A, SED- 4B; SED-05A/B/C, SED-06A/C, SED-07A/B/C; SED-08A/C; SED-09B; SED-10A/B, SED-11C, etc. The document should be revised to include additional at-depth (below 0.5 ft.) sample collection/analysis for EPH at all historic and proposed sample locations/transects. In addition, please specify if/when the samples hit bedrock and the corresponding depth.

Response 7: Please refer to Response 4. It was agreed at the September 17, 2018 meeting and in the November 2018 RTC that "Chevron will resample all past locations for EPH analysis where EPH was not analyzed previously." The proposed additional sample depths are provided in revised Table 1. No other additional sampling is proposed. The USEPA's request for information on depth to bedrock appears to be a misunderstanding, since bedrock was not encountered during sampling, whereas refusal was encountered. The vertical limit of soft sediment in Woodbridge Creek coincides with the top of the underlying glacial till, which is sufficiently competent and refused the Vibracore drilling stem. As reported in Section 2 of the SEER (Attachment 1), bedrock was encountered in terrestrial borings from 65-85 feet below grade, well below the bed of Woodbridge Creek.

USEPA Comment 8. Section 2.1 Sample Collection, Additional Vertical Samples at Existing Boring Locations, Page 6: Though titled "Additional Vertical Samples" this section only discusses the collection of shallow samples at transect SED-19. As noted above regarding EPH, the document should be revised to include the collection of shallow and at-depth (greater than 0.5 ft. interval) samples for the full suite of parameters at all existing and proposed transects/locations where data does not previously exist.

*Response 8: The commenter misinterprets the quoted text. Section 2.1 of the SFSAP states that "...**only deeper samples were taken** at boring locations SED-19-B and SED-19-C (Emphasis added). Shallow samples to fill this gap will be taken at SED-19-B and SED-19-C." Figure 4 from the SEER (Attachment 1) provides the EPH data from SED-19 B and SED-19-C at 6-6.5 feet (16,000 mg/kg) and 7.5-8 feet (8,170 mg/kg) below the sediment surface. The shallow (0-0.5 feet) interval is the data gap to be filled by the proposed samples, as noted on revised Figure 2, and on Figure 2a and Table 1.*

USEPA Comment 9. Section 2.1.1 Sediment Sampling, Page 6: The document states, "...sediment cores will be advanced ...to refusal, or a total depth of 10 feet below the sediment surface or to the top of underlying parent material, whichever is encountered first." The document later states, "All locations will be advanced to interface of the sediment and parent

material or refusal." The document should be revised to be consistent. However, based on boring logs for several adjacent SWMU's, we are not certain that limiting boring depth to 10 feet is adequate for all locations. A quick review of boring logs associated with SWMU 40 suggests the presence of free/residual LNAPL to a depth of 26 ft. bgs in borings (i.e. S40-7/U040-007, MW-33, U040-001, HP-0001-D, S40-7/U040-007, S40-8/U040-008, etc.) along the shoreline of Woodbridge Creek. Since information, such as this, is scattered across numerous documents, we were unable to do a more thorough evaluation of all the waterbodies. The document should be revised include a figure and thorough discussion of all existing soil borings along the shorelines specifically at AOCs/SWMUs where LNAPL has been detected so that we can confirm if the proposed locations adequately evaluates impacts to the waterbodies via seepage or direct discharge. Furthermore, unless Chevron has data to indicate no contaminant migration pathway from these SWMUs where LNAPL was detected to the adjacent waterbodies, we reiterate the need for contingency borings to determine the full extent of petroleum product impacting the waterbodies and the subsurface.

Response 9: The text regarding the depth of termination for proposed borings has been revised for consistency, and where possible, sediment coring will proceed to greater depths, up to 20 feet.. Chevron disagrees with the comment regarding uncertainty of the proposed 10-foot boring limit and the concern over LNAPL found at greater depths in SWMU 40. As noted above, the 2003 BEE indicated that there are no current migration pathways (including evaluation of LNAPL areas) between SWMUs along the shoreline and the adjacent waterways. In addition, LNAPL monitoring reports indicate limited and declining LNAPL extents (Appendices B-2, B-4, B-5). LNAPL monitoring is accomplished at the Facility by gauging liquid product thicknesses (or its absence) in groundwater monitoring wells, and does not rely on historical soil boring logs, including the cited ones that are from 1995-1997 (Attachment 4). While LNAPL was noted in several borings, it was generally limited to the interval above the water table, generally within 8-12 feet, and above an organic layer comprised of peat and organic silt/clay. Fill was encountered in the entire profile at Boring U040-007, completed to 26 feet. It contained approximately 20 feet of petroleum catalyst beads, with LNAPL from 12-26 feet. Given the presence of the catalyst beads in the fill documented in the log for U040-007, the presence of LNAPL is not surprising. However, LNAPL appears less prevalent in flanking borings U040-001 and U040-008, and in the log for MW-33 (0033), suggesting that the LNAPL extent is limited (Attachment 6). The SEER concluded that "there is no indication of ongoing discharges of hazardous substances from the site based on the soil and groundwater sample analysis, and light, non—aqueous phase liquid (LNAPL) investigation."

Section 7 of the 2003 RFI (Appendix B-2) provides a comprehensive description of LNAPL areas at that time, and similarly concluded that the LNAPL was generally immobile. Subsequent monitoring reports provided annually to the USEPA have indicated no impacts to the adjacent waterways and noted the on-going reduction/elimination of LNAPL overall. The LNAPL detected in the SWMUs has been demonstrated to be virtually immobile and therefore does not represent a source of the contaminants detected in creek sediments. The existing and proposed sediment

sample locations are positioned in a manner where potential LNAPL or related contaminants would be detected.

USEPA Comment 10. Section 3.0 Deliverables, Page 8: The document states, "The report will incorporate the results of soil and groundwater data from adjacent SWMUs and AOCs." As noted above, this information (figure/boring logs, etc.) should be included in the revised SFSAP, for any adjacent AOCs/SWMUs where LNAPL or where highly elevated COCs are present in the soil or groundwater, so that we can confirm if the proposed locations adequately evaluate impacts to the waterbodies. The revised SFSAP should also include historic discharge monitoring data (as referenced in Attachment 3) and any other information concerning past waste management practices, that will be necessary to evaluate the proposed sampling program.

Response 10: Inclusion of analytical results from the 2002 and 2014 investigation of adjacent SWMUs and AOCs into the Supplemental RFI Report (SRFI) is proposed for a comprehensive review of the soil and groundwater conditions along the adjacent waterways. For informational purposes, data from the 2014 sampling event is included in Tables I-IX of the SEER (Attachment 1) and the 2002 sediment data associated with the BEE is included in Appendix B-3. This data was previously provided, and its incorporation is not intended to evaluate the representativeness of the proposed sample locations, or to identify analytical data gaps, as soil, groundwater, and sediment have been analyzed for the same broad suite of parameters (i.e., VOCs, BNs, metals, TOC, grain size, as applicable based on the sample matrix). Please refer to Response 3 and referenced attachments, appendices, and figures regarding the inclusion of historic discharge monitoring data and waste practices.

USEPA Comment 11. Table 1 Proposed Sediment Sampling: Table 1 should be revised to include why each, sample location and interval is proposed, referencing the specific contaminant migration pathway (i.e., specific AOC, SWMU, outfall, former tidal creek, etc.) that is being evaluated. As noted above the document should also include a summary of historic sample locations, in table form, to confirm that what is proposed is sufficient.

Response 11: Table 1 has been revised and is included in the Revised SFSAP. The sample locations are listed on the table and correlated with information concerning historic/current discharge outfalls, SWMUs, and AOCs on the adjacent shorelines. However, it cannot be overstated that the objective of the proposed investigation is to comply with the HSWA permit provisions, and not completion of an exhaustive study linking sediment the broadly-contaminated sediments with specific historical Facility operational areas.

USEPA Comment 12. Attachment 5 Dredging Documents: Chevron had suggested that due to historic dredging of Arthur Kill no additional sampling was necessary as noted in supporting documentation included in Attachment 5. However, review of Figure 5-1 suggests that dredging of the Arthur Kill was limited to two areas (A and B) adjacent to SWMUs 36 and 45 only.

Furthermore, Attachment 5 did not include any analytical data or information regarding contaminant concentrations in the dredged material and only included dredging permit authorization for Area B. Attachment 5 should be revised to include additional information on dredging activities and pre-dredging contaminant concentrations for both Areas A and B. Furthermore, based on the limited information provided, it is unclear if any impacts to Arthur Kill from adjacent SWMU 36 and 45 were noted during dredging activities. The document should clarify if any impacts from these SWMUs were noted during dredging operations. The document should also clarify/discuss if there are other adjacent AOCs, with the potential to impact the Arthur Kill, including but not limited to: PAOC 15, AOC 29 and EY 4a LNAPL areas, AOC 29, and wells MW-155R, etc. The document should be revised to conduct additional sampling in Arthur Kill to confirm no impacts at depth from adjacent AOCs/PAOCs/SWMUs.

Response: Information regarding areas of the Arthur Kill waterfront (Areas A and B) that were dredged in in November 2003 was provided as requested by the USEPA during the September 17, 2018 meeting. Please note that the dredging was conducted to maintain the tanker berths and not for sediment remediation purposes, therefore, information on adjacent AOCs and sediment sampling and analysis to determine pre-dredging conditions was not required for dredging permit authorization. No impacts from the adjacent AOCs/PAOCs/SWMUs are known to have occurred during dredging and filling operations. Subsequent sampling at SED-13C, -14C, -15C, and -18C provides sufficient data to characterize sediment conditions in the in this area. Further, the benthic zone (0-0.5 feet) was removed from the berthing areas as a result of the most recent maintenance dredging, and likely prior dredging, which prevents establishment of a normal benthic community regardless of potential Facility-related discharges. Further sediment evaluation in the berthing areas is therefore not warranted.

We trust that this letter and attachments address the USEPA's questions and concerns raised in the March 1, 2019 comment letter. Please note that an expeditious review is needed in order to complete the RFI for surface waters and meet the RCRA 2020 goal. While we believe that this letter and the associated SFSAP meets the USEPA's requirements, Chevron requests the opportunity to discuss the SFSAP with appropriate representatives of the USEPA, the NJDEP, and TRC at a meeting to be scheduled at the earliest possible convenience. The purpose of the meeting is to present the SFSAP, discuss any of the concerns on the part of the agencies, and to expedite final approval and implementation without further submissions. Please contact the undersigned if you have any questions and to discuss the timing and location for the proposed meeting.

Sincerely,

William S. Cordasco, Sr. Scientist

Kenneth Siet, Vice President

Cc: Lynn Vogel, NJDEP
Robert Mancini, Chevron
Todd Frantz, Parsons

Ltr RTC EPA 2July2019F

TRC

FORMER CHEVRON PERTH AMBOY FACILITY
SUPPLEMENTAL FIELD SAMPLING AND ANALYSIS PLAN
SEDIMENTS
(Revised July 2019)
EPA I.D. # NJD081982902
TRC Project No. 230668

Prepared for:

Chevron USA

Prepared by:

TRC Environmental Corporation
41 Spring Street
New Providence, New Jersey 07947

July 2019

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SUPPLEMENTAL FIELD SAMPLING AND ANALYSIS PLAN
SEDIMENTS (Revised July 2019)
FORMER CHEVRON PERTH AMBOY FACILITY
PERTH AMBOY, MIDDLESEX COUNTY, NEW JERSEY
EPA I.D. # NJD081982902

1.0 INTRODUCTION

TRC Environmental Corporation (TRC), on behalf of Chevron USA (Chevron) has revised the Supplemental Field Sampling and Analysis Plan (SFSAP) for collection and analysis of additional sediment samples from Woodbridge Creek, Spa Spring Creek, and the Arthur Kill proximate to the former Chevron Facility located in the City of Perth Amboy, Middlesex County, New Jersey (the Facility). This SFSAP was updated to provide the USEPA with additional supporting information regarding the basis for proposed sediment sampling, based on their March 1, 2018 comments on the previous (November 2018) SFSAP (Appendix A). The SFSAP is being submitted (as revised) pursuant to the Hazardous and Solid Waste Amendments (HSWA) Permit Renewal and Permit Modification I issued by the United States Environmental Protection Agency (EPA) in 2013 to Chevron USA, Inc. – Buckeye Perth Amboy Terminal LLC (EPA I.D. # NJD081982902). The 2013 HSWA Permit requires that the RCRA Facility Investigation (RFI) be completed for the three water bodies[1]. The investigation of these surface water bodies began in 2002 as part of the Facility wide RFI. This SFSAP proposes supplemental sediment sampling to complete this investigation, including data gaps identified in previous phases of the RFI for the three water bodies. Once completed, this sampling effort is intended to be the final phase of the RFI for the three water bodies. A comprehensive supplemental RFI report for the three surface water bodies (incorporating all prior surface waste body investigations) will be submitted upon completion of the field work proposed in this SFSAP.

The Facility is located near the confluence of Woodbridge Creek and the Arthur Kill in an older urban/industrial area of Perth Amboy (Figure 1). The SFSAP was originally prepared as part of the overall response to a letter from the USEPA, containing recommendations and comments from the New Jersey Department of Environmental Protection (NJDEP) dated August 31, 2018. The August 31, 2018 letter requested additional sediment sample collection in Facility-adjacent waters, as further discussed at a subsequent meeting on September 17, 2018 between Chevron, the USEPA, and the NJDEP. The SFSAP was submitted to the USEPA in November 2018, and Chevron received additional comments from USEPA in their letter dated March 1, 2019. Consequently, Chevron has prepared this July 2019 revised SFSAP to address those latest comments. The proposed sampling locations and analyses, as revised, are shown on revised Figure 2, and on Figure 2a.

Investigative History

Several phases of a RFI for the three surface water bodies have been completed for the Facility pursuant to the HSWA Permit.. These investigations targeted specific surface water locations

[1] see 2013 HSWA Permit, Module III, Condition B.2. Page 25 and 26

where adjacent Facility areas designated as Solid Waste Management Units (SWMUs), Areas of Concern (AOCs), Potential AOCs (PAOCs), areas with evidence of subsurface Light Non-Aqueous Phase Liquids (LNAPL) and various known points of storm/wastewater effluent discharge existed. Additional background and other sampling locations were also included in prior inveatigations.

In 2002, Chevron collected approximately 16 surface water samples and 44 sediment samples from water bodies adjacent to the Facility (Woodbridge Creek, Spa Spring Creek, and the Arthur Kill), some or all of which were analyzed for organic and inorganic chemical constituents including volatile organic compounds (VOCs), base neutral compounds (BNs), metals, and petroleum hydrocarbons. The results of the 2002 surface water and sediment investigation were provided to the NJDEP and USEPA in the Baseline Ecological Evaluation (BEE) that was included as Section 9 in Chevron's November 2003 RFI Report and Chevron's February 2008 Supplemental RFI Report (SRFI Report). The 2002 sediment sampling event identified various organic compounds (primarily BNs) and metals in multiple sediment samples. Petroleum staining was identified in some sediment sample cores during field sampling. Contaminants of Potential Ecological Concern (COPECs) were identified based on comparison of laboratory analytical results to ecological screening criteria.

In 2014, Chevron conducted a supplemental sediment investigation of Spa Spring Creek and Woodbridge Creek to further investigate these waterbodies under the HSWA Permit and respond to comments raised by NJDEP and EPA on their review of Chevron's 2003 BEE Report. As part of the 2014 supplemental field work, Chevron completed 14 additional sediment cores and collected approximately 14 additional sediment samples from Woodbridge Creek and Spa Spring Creek. The results of this supplemental work were provided in Chevron's Supplemental Ecological Evaluation Report, dated 2016 (SEER), included as Attachment 1. As part of the SEE, Chevron completed the re-evaluation of COPECs, collected additional sediment samples in Spa Spring Creek and Woodbridge Creek including analysis for Extractable Petroleum Hydrocarbons (EPH; this analytical method was not available during the prior 2002 investigation) and further evaluated potential contaminant migration pathways to surface water. In addition, a bathymetric survey was completed in the lower portion Woodbridge Creek (see Figure 6 in Attachment 1).

1.1 SURFACE WATER BODIES / FACILITY STORM AND WASTEWATERS

1.1.1 Surface Waters

The surface water bodies bordering portions of the Facility have been evaluated as environmental receptors, as noted above. They include Spa Spring Creek to the north, Woodbridge Creek to the north/northeast, and the Arthur Kill to the east (Figure 2). The Arthur Kill is a tidal straight separating New Jersey and Staten Island (New York City). Woodbridge Creek and Spa Spring Creek are tidal, brackish estuarine waters that flow past the Facility. Water flow and elevation in these waterways fluctuate based on the diurnal and spring tidal cycles. The sediments in these waterways are the focus of the sampling proposed in this SFSAP.

The reach of Spa Spring Creek along the Facility's northern border consists of a smaller, manmade channel that empties into Woodbridge Creek. Immediately upstream of the Facility, Spa Spring Creek flows through an industrial area. Further upstream Spa Spring Creek flows under a rail road

and through an urban residential area. Prior to its diversion along the Facility's northern boundary, Spa Spring Creek naturally flowed through the location of the former North Field Basin (currently Chevron's tidal wetlands creation project area). Previously Chevron had a NJPDES permitted discharge to Spa Spring Creek.

The Arthur Kill itself is part of the New York-New Jersey Harbor complex and is a tidal strait connecting the Kill van Kull and Newark Bay to the north with Raritan Bay and the Raritan River to the south. Tidal surges come from both the Kill Van Kull/Newark Bay and the Raritan Bay/estuary, with an average flushing time of two weeks and an average semi-diurnal tidal range of 1.6 meters (5.3 feet). The major freshwater inputs are the major tributaries of the Arthur Kill: the Rahway River, the Elizabeth River, and the Fresh Kills, which contribute about 38 percent (122 cubic feet per second (ft^3/sec)), with the balance of 62 percent (200 ft3/sec) coming from smaller tributaries, sewage treatment plants, combined sewer overflows, and industrial discharges. The salinity of the Arthur Kill varies from 17 to 27 ppt at the southern end to nearly freshwater in some of the tributary mouths.

The Arthur Kill is an important industrial/commercial water way and is surrounded by one of the most densely populated coastal areas in the world. According to the United States Fish and Wildlife Service, there is a concentration of industrial uses adjacent to the Arthur Kill, especially for port facilities and petroleum and chemical industries[2]. Significant modifications of the physical features of the Arthur Kill and its tributaries were made to serve the maritime transportation and related industries in the New York/New Jersey harbor area, beginning in the mid-late 1800s. The highly industrialized waterway is dredged to maintain an average channel depth of nine meters (30 feet) and much of the shoreline is comprised of bulkheads or rip-rap. Land use along the Arthur Kill includes railroad yards, petro-chemical bulk storage and transfer facilities, bulkheads, docks, road systems, New York City's Freshkills landfill, power plants, petroleum refineries, chemical plants, and other industrial and residential land uses. Prior to the advent of the NJPDES permit program, Chevron dicharged treated storm water to the Arthur Kill at the approximate location of the former East Yard separator.

Woodbridge Creek extends approximately 5.4 miles terminating at the Arthur Kill with several prominent meanders along its course. Woodbridge Creek is bounded by mudflats and tidally-flowed wetlands, as well as numerous, residential, industrial, commercial and abandoned properties. Several wetland restoration projects have been conducted along its banks. At normal high tide, the Creek is approximately 100 feet wide as it flows past the Facility. Woodbridge Creek empties into the saline Arthur Kill several hundred feet north of the Facility's East Yard. While not as developed as the Arthur Kill,Arthur Woodbridge Creek has a long industrial history. Petroleum facilities, chemical plants, metal recycling plants, brick manufacturing plants an industrial landfill and a commercial hazardous waste reprocessing plant existed along the banks of Woodbridge Creek in proximity to the Facility[3].

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[2] United States Fish and Wildlife "SIGNIFICANT HABITATS AND HABITAT COMPLEXES OF THE NEW YORK BIGHT WATERSHED Arthur Kill Complex" see https://nctc.fws.gov/resources/knowledge-resources/pubs5/web_link/text/akc_form.htm

[3] See aerial photos from 1972 and 1978 in Appendix B-6. Also see the USEPA Region 2 RCRA Corrective Action Environmental Indicator (EI) report, June 12, 2008 for the CP Chemicals Facility (EPA Facility ID# NJD002141950) located across Woodbridge Creek from the Facility acknowledges "the industrialized nature of Woodbridge Creek".

As will be discussed in Sections 1.1.3, below, Chevron's former Effluent Treatment Plant (ETP) located along Woodbridge Creek, discharged treated process and storm water to the Creek under a NJPDES permit while the Refinery was in operation. Prior to construction of the ETP in 1976 and the NJPDES permitting program, stormwater and process waters from the Refinery were treated in several ponds and separators located near the Creek and discharge treated effluent to Woodbridge Creek in the vicinity of the current ETP.

Several current or former industrial facilities are located adjacent to the Facility including the former Amerada Hess bulk petroleum storage and distribution facility, the former American Steel and Refining Company (ASARCO), the former Shell (now Motiva) bulk petroleum storage and distribution facility and the former American Cyanamid chemical manufacturing plant. The former CP Chemical plant, a commercial hazardous waste facility, existed directly across Woodbridge Creek from the facility. The former Hess and the Shell/Motiva sites front both the Arthur Kill and Woodbridge Creek, the ASARCO site is located to the south on the Arthur Kill, while the American Cyanamid site is along a tributary to Woodbridge Creek and upstream of the Facility.

1.1.2 Facility Storm and Wastewater Management

The following is an overview of Chevron's management of process water and stormwater runoff. This summary was previously provided in the 1994 *Description of Current Conditions Report* (DOCC) and the RFI report. This summary is being submitted again based on NJDEP and USEPA March 1, 2019 comment letter and subsequent discussions with Chevron. Relevant sections of the DOCC are included as Attachment 2.

General wastewater management operations can be divided into three main periods: (1) prior to 1976; (2) between 1976 and 1987; and (3) after 1987. These divisions are based upon the construction of the current Effluent Treatment Plant in 1976 and the removal of the stormwater surface impoundments from service in approximately 1987.

Prior to 1976

Prior to the construction of the ETP, Refinery stormwater was apparently discharged to both Woodbridge Creek and the Arthur Kill after treatment. Process water from refining operations was likely discharged to Woodbridge Creek after treatment. No information is available to Chevron regarding potential discharge(s) to Spa Spring Creek during this period.

- **East Yard Discharges:** Discharges from the East Yard to the Arthur Kill were treated by an oil/water separator, referred to as the Oil Water Separator Near EYB (SWMU 36), which was operated from approximately 1950 to 1976. No information is currently available regarding the management of East Yard stormwater and wastewater prior to 1950.
- **Other Discharges:** Wastewater discharges from the Central Yard, West Yard, Main Yard and North Field were routed through the OWSS (AOC 16) to several oil/water separator systems located in the North Field. The oil/water separator systems recovered

oil and removed suspended solids by settling. The effluent from the oil/water separator systems were discharged to Woodbridge Creek.

Information regarding which specific areas within the Refinery were routed to the individual oil/water separator systems is currently unavailable. The oil/water separator systems in the North Field included:

- **Old Pond (SWMU 40):** The No. 1 Separator was connected to the "Old Pond". The Old Pond was operated from prior to 1940 to approximately the early 1970's. Aerial photos indicate that this unit discharged to Woodbridge Creek.
- **No. 4 Separator (SWMU 35):** The No. 4 Separator included a pond referred to on Refinery drawings as the Gentry Pond. This unit operated from approximately 1950 to 1977. Aerial photos indicate that this unit discharged to Woodbridge Creek.
- **Surge Pond (SWMU 2):** The Surge Pond was constructed in approximately 1950. It is likely that the Surge Pond received the majority of the stormwater runoff from the North Field and Main Yard. Oil/water separator sludge, tank bottoms and other wastes were placed in the Surge Pond after its original function for stormwater retention was superseded by the NFB in approximately 1960.
- **NFB (SWMU 1):** The NFB was created in 1960 to replace the Surge Pond for stormwater retention and to provide aggressive biological treatment prior to discharge to Woodbridge Creek.
- **No. 2 and No. 3 Separators (SWMU 31):** These Separators were associated with the Surge Pond and the NFB and recovered oil from these units prior to discharge to Woodbridge Creek.

Dredged materials removed from these oil/water separator systems during maintenance were reportedly placed in an area now known as the Mud Flats (SWMU 43), which was constructed in approximately 1955.

Between 1976 and 1987

In 1976, Chevron constructed the ETP in the North Field adjacent to Woodbridge Creek. The addition of the ETP significantly upgraded Chevron's ability to treat process water and stormwater runoff. Between 1976 and 1987, all wastewater and stormwater discharges, with the exception of a small volume of stormwater discharge to Spa Spring Creek, were routed through the OWSS to the ETP for advanced oil recovery and biological treatment, prior to discharge to Woodbridge Creek. Stormwater in excess of treatment capacity was held in the NFB prior to treatment at the ETP.

Excess stormwater runoff from the Central Yard, West Yard, Amboy Field, Main Yard and North Field was collected in the NFB and then routed to the ETP when treatment capacity was available. Water passing through the No. 2 and 3 Separators was routed to the ETP. After the construction of the ETP, several of the old oil/water separator systems were taken out of service including the Old Pond/No. 1 Separator, No. 4 Separator and the oil/water separator in the East Yard.

In 1976, Chevron constructed the EYB (SWMU 3) to replace the oil/water separator near the EYB, which discharged to the Arthur Kill. The EYB was equipped with a pump station that routed the water via the OWSS to the new ETP in the North Field.

After 1987

In 1987, Chevron stopped using the NFB and EYB as stormwater holding impoundments. No stormwater was diverted to the NFB and EYB after 1987. These units were subsequently closed under NJDEP oversight.

The temporary East Yard stormwater storage capacity provided by the EYB was replaced by a single stormwater holding tank (Tank 765). The temporary North Field stormwater storage capacity provided by the NFB was replaced by a series of four stormwater holding tanks (Tanks 326, 327, 328 and 330). The excess water diverted to the holding tanks during storm events is routed to the ETP for treatment.

Effluent Waste Treatment Plant

While the former Refinery was operating, process water and stormwater were treated at the ETP prior to being discharged into Woodbridge Creek. The processes at the ETP include:

- Primary oil removal in an API Separator;
- Secondary oil removal in an Induced Air Flotation (IAF) Unit;
- Aeration and 24-hour equalization in the equalization tank;
- Removal of dissolved contaminants with a biodisk system;
- Removal of suspended solids in a clarifier; and
- Additional equalization in a post-aeration basin (PAB) prior to final discharge to Woodbridge Creek. The effluent from the PAB was discharged to Woodbridge Creek via a 24-inch diameter underground outfall line (DSN-005A). This discharge point is still used by the current owner (Buckeye).

Buckeye, the current owner of the Facility, continues to operate the ETP. Operation has been scaled back over the years as refining operations ceased. Buckeye currently operates the Facility solely as a petroleum terminal. Stormwater runoff from petroleum storage areas is the principal waste stream currently handled by the ETP.

NJPDES Discharge to Surface Water Permits

Buckeye (current facility owner) monitors the effluent from the ETP, which is discharged to Woodbridge Creek under its FWP. Chevron previously monitored discharges to Spa Spring Creek and a drainage ditch in Amboy Field during their tenure at the facility. The following is an historical breakdown of Chevron's Dischage to Surface Water (DSW) Permits with key information:

June 1974 to Approximately 1979

Available records indicate that the Refinery was operating under an NPDES DSW permit during this period. NJDEP was not the implementing agency at this time. No relevant information for this period is currently available.

July 3, 1979 to Approximately 1984

Available records for the 1979 DSW permit describe only Discharge Point 004, which was listed as effluent from the Power Plant to Spa Spring Creek. It is likely that this permit also covered the ETP.

- **Units Covered:** Discharge Serial Number (DSN) 004: Power Plant - non-contact cooling water from turbo generator condenser.
- **Significant Changes from Previous Issuance:** No copies of an earlier permit have been located. However, it appears from the 1979 DSW permit that this discharge point (DSN 004) has been regulated since June 14, 1974.

January 25, 1985 to Approximately 1990

In 1985, DSW Permit jurisdiction was transferred from EPA to NJDEP. NJPDES DSW Permit No. NJ0000221 allows the Refinery to discharge process water and stormwater to surface waters, which include Spa Spring Creek and Woodbridge Creek.

- **Units Covered/Discharge Points Monitored:** This permit covered two discharge points: DSN 004 and DSN 005.

  DSN No. 004: Spa Spring Creek - covered power plant water softener regeneration water and stormwater runoff from non-process areas of Chevron, as well as from property owned by others and from public roads.

  DSN No. 005: Woodbridge Creek - covered process water and contaminated stormwater runoff that is treated by the ETP using mechanical and biological methods.

- **Significant Changes from Previous Issuance:** Significant changes in the 1985 DSW Permit included the change of jurisdiction and the inclusion of DSN 005, located at the outfall of the ETP.

October 1992 Modification

Chevron applied for and received a modification to the NJPDES DSW Permit in 1992. The permit modification incorporated the stormwater runoff from undeveloped portions of Amboy Field to a discharge point entering a ditch along Amboy Avenue.

- **Units Covered:** Discharge to point DSN 006, which received stormwater runoff from Amboy Field to the Amboy Ditch.

August 1, 1993 to July 31, 1998

On June 25, 1993, NJDEP issued a Final NJPDES DSW Permit Reissuance to Chevron, which became effective August 1, 1993. The revisions to the permit enabled Chevron to accurately monitor contributions to the Spa Spring Creek outfall and discharges associated with the sludge dewatering operations.

- **Units Covered/Discharge Points Monitored:**
  DSN 004A, 004B and 004C: Spa Spring Creek Outfalls

DSN 005: ETP
DSN 005A: ETP
DSN 006A: Runoff from undeveloped portion of Amboy Field to Amboy Ditch

- **Significant Changes from Previous Issuance:** The single terminal discharge point, known as DSN 004, was identified as DSN 004A, and two upstream monitoring points, identified as DSN 004B and DSN 004C, were added.

March 1, 1999 to 2012 (Sale to Buckeye)

In January 1999, the NJDEP issued a New Jersey Facility Wide Permit (No. NJ00011) to Chevron. The FWP replaced the NJPDES DSW Permit No. NJ0000221. The FWP renewed the permit for the ETP outfall, identified as DSN 005A, to discharge treated process water to Woodbridge Creek and specified effluent limits. The FWP no longer requires monitoring, record keeping and reporting for DSN 004B and DSN 006A (Spa Spring Creek and the drainage ditch in Amboy Field).

1.1.3 Response to USEPA Comments Regarding Effluent Discharges

The USEPA noted in Comments 2 and 3 of its March 1, 2019 letter that additional information was needed to evaluate potential impacts to waterways from runoff and non-point discharges, point discharges, and to otherwise describe historical practices related to management of storm and process waste waters. This information is summarized above and was previously described in several documents and is provided for convenience and to expedite the review process. The Facility's current permitted storm water/wastewater discharge (operated by the current owner, Buckeye Perth Amboy Terminal, LLC) is located along Woodbridge Creek. Attachment 2 includes relevant sections of the August 1994 DOCC report noted above (prepared by ESE, Inc.). The DOCC report provides a comprehensive evaluation of the historical and then-current practices related to waste disposal at the Facility, especially Section 3 of the DOCC which describes wastewater and process discharges to the adjacent waterways (Attachment 2). The drawing titled *Land Use/Drainage* included in Appendix B shows drainage infrastructure, containment structures, catch basins, treatment facilities and outfalls to surface waters in existence at the Facility as of January 1993. Flow arrows on this drawing indicate that drainage from most of the bulk storage tank impoundments was collected and discharged to the Effluent Treatment Plant (ETP) along Woodbridge Creek. Drainage from the western portions of the Facility including the Amboy Tank Field and discharges of non-contact cooling water from the former West Yard power plant was conveyed to Spa Spring Creek. The drawing indicates that a portion of the flow from the West Yard and Amboy Tank field diverged approximately 1,200 feet north of the West Yard. It is believed that the power plant's non-contact cooling water discharged to DSN004, while the stormwater flowed to the ETP. The information provided by the DOCC and Land Use/Drainage plan address the USEPA's comments regarding historical discharges and storm/waste water management. Information on older waste management practices at the Facility is unavailable.

The USEPA also recommended that Chevron review the 1965 report prepared by the Interstate Sanitation Commission titled "*Location of City Sewers adjacent to Industrial Plants Bordering the Arthur Kill in New Jersey*," (ISCR). Please be advised that Chevron used the ISCR document to help identify SWMUs in their DOCC Report previously submitted to NJDEP and USEPA in 1994. The ISCR document identified API Separators #1 and #2 and the settling basin at Woodbridge

Creek. As stated in the 1994 DOCC Chevron identified all the separators and ponds listed in the ISCR report as SWMUs as follows:

- SWMU 36: is the former "*East Yard Tank Farm Separator*" at the Arthur Kill as discussed in the ISCR document (DOCC, page 2-11).
- SWMU 40: includes the former *Separator #1* and the former *settling basin* (Old Pond) at Woodbridge Creek as discussed in the ISCR document (DOCC, page 2-12).
- SWMU 31: includes the former *Separator #2* at Woodbridge Creek as discussed in the ISCR document (DOCC, page 2-12).

The ISCR notes that all sanitary wastes were discharged to the 12-inch diameter public sewer on State Street. Maps included in the ISCR do not provide any detail for the Facility.

1.2 OBJECTIVE

The objective of the revised SFSAP is to provide supplemental information to address the data gaps identified and related to the RFI of Woodbridge Creek, Spa Spring Creek, and the Arthur Kill, and thus fulfill the requirements set forth in the Facility's HSWA Permit. Specifically, the proposed investigation is intended to supplement the prior investigations conducted in 2002 and 2014, in accordance with the August 31, 2018 USEPA/NJDEP letter and comments, as revised pursuant to the September 17, 2018 meeting, and the USPEPA's March 1, 2019 letter. Related USEPA correspondence is included in Appendix A.

1.3 DISCUSSION OF USEPA MARCH 1, 2019 COMMENTS AND SFSAP MODIFICATIONS

The USEPA's March 1, 2019 comments were addressed individually in the Response to Comments dated July 1, 2019 (July 2019 RTCs) prepared by TRC. As indicated in the July 2019 RTCs, this SFSAP was modified to address the USEPA's concerns, which generally involved presenting historical data to support and clarify the basis of proposed sediment sample locations/depths with respect to adjacent terrestrial areas of contamination (e.g., SWMUs, AOCs, PAOCs, related LNAPL areas). The comments will be discussed in the specific sections referenced by the USEPA in the March 1, 2019 comment letter. The following, previously-provided items but have been attached to this SFSAP to assist the USEPA with completing its review and are referenced where appropriate to address the USEPA's comments:

Figure 2a: Proposed Sediment Sample Locations and Supplemental Information: Figure 2a was added to the SFSAP to include SWMUs, AOCs, and PAOCs (including areas of LNAPL) within 200 feet of the adjacent waterways and other Facility features, and historic/proposed sediment sampling locations in the waterways. Figure 2a addresses the USEPA's Comment 2 request that *"...Figure 2, should be revised to discuss, at length, any AOCs/SWMUs/PAOCs with the potential to impact these waterbodies, including but not limited to: SWMUs 1, 2, 3, 7, 8, 24, 26, 31, 35, 36, 40, 41, 45, etc."* Inclusion of Figure 2a also provides

information for other USEPA comments regarding historical Facility features and locations with respect to proposed sediment sampling.

Figure 3: Sitewide AOC/SWMU Map with 2012 and 2013 Q1/Q2 LNAPL Extent: This drawing was included in the 2012 and Q1/Q2 2013 Stabilization Measures Status Report previously submitted to the USEPA and shows all of the AOCs and SWMUs at the Facility with the horizontal extent of LNAPL in each area for the subject years. Proposed sediment sample locations are also shown.

Figure 4: Fourth Quarter 2012 LNAPL Extent: This drawing was included in the 2012 and Q1/Q2 2013 Stabilization Measures Status Report previously submitted to the USEPA. It supplements Figure 3 by providing spefiic details on LNAPL thickness in each area.

Figure 5: Areas of Concern, Solid Waste Management Units, Potential Areas of Concern Figure 2-2 by Parsons, Inc. (November 19, 2008): This Figure was presented during the September 2018 meeting and shows SWMUs/AOCs/PAOCs for the entire Facility. It has been updated to include all proposed sediment sample locations and explanatory notes.

Supplemental Ecological Evaluation Report, November 1, 2016 (SEER) - Attachment. 1: The SEER was included in its entirety to provide background data and other information requested by USEPA in their comments. Specific sections of the SEER are referenced further in the SFSAP where appropriate, to provide further detail.

Relevant sections of the August 1994 Description of Current Conditions (DOCC) report - Attachment 2: The DOCC was previously supplied to the USEPA since it described historical conditions at the Facility and wastewater discharge and waste management and disposal practices known up to the mid-1990s. Relevant sections (i.e., Section 3) of the DOCC are attached to address the USEPA's comment 3, which states that "*The document should be revised to discuss waste management practices prior to 1974 (date of initial Federal NPDES permit), prior to city sewer connections, and identify historic direct discharges of industrial waste into the three waterbodies.*

NJDEP Land Use/Land Cover Mapping – Attachment 3-1: This map provides an area-wide identification of land uses in the vicinity of the Facility, e.g., industrial, residential, etc.

Sediment and LNAPL Area Boring Logs-Attachment 4: The USEPA's Comment 9 states "*A quick review of boring logs associated with SWMU 40 suggests the presence of free/residual LNAPL to a depth of 26 ft. bgs in borings (i.e. S40-7/U040-007, MW-33, U040-001, HP-0001-D, S40-7/U040-007, S40-8/U040-008, etc.) along the shoreline of Woodbridge Creek... The document should be revised to include a figure and thorough discussion of all existing soil borings along the shorelines specifically at AOCs/SWMUs where LNAPL has been detected...*" The logs for each of the borings referenced in the USEPA's comment above

were reviewed and are included as Attachment 4, along with sediment core logs for Vibracore sampling in the waterways.

Appendix A: Relevant Correspondence: Appendix A includes Chevron's Response to the USEPA's August 31, 2018 letter that was included with the November 2018 SFSAP.

Appendix B: Relevant documents have been included in Appendix B that provide specific information on the historical discharges to the adjacent waterways, waste and storm water conveyance and treatment systems, and locations of LNAPL areas at the Facility. These additional documents are referenced further in this SFSAP and include:

- B-1: *Land Use and Drainage* (January1993, Coastal Environmental Services). Appendix B-1 is a plan showing the on-Facility stormwater collection system and discharge locations as of January 1993.
- B-2: Section 7 of the November 2003 RFI report describing LNAPL conditions.
- B-3: Section 9 of the November 2003 RFI report – Baseline Ecological Evaluation and associated sediment analytical data tables.
- B-4: *Third Quarter 2013 Progress Report, Former Chevron Perth Amboy Facility – 2012 and Q1/Q2 Stabilization Measures Report* – Reporting Period January 1, 2012-June 30, 2013.
- B-5: Table 3, Liquid Measurement Data from Appendix A of the LNAPL Quarterly Report, First Quarter 2019, by Parsons, Inc.

1.3.1 Response to USEPA Comments

As noted above, Chevron provided general responses to each of the USEPA's March 1, 2019 comments in the associated July 2019 RTCs. Additional, detailed responses are included in the SFSAP, as revised. The USEPA Comments 1, 2, and 3 are general comments pertaining to Section 1.0 of the SFSAP, and are therefore addressed in this section; other USEPA comments are addressed in subsequent sections:

USEPA Comment 1. Section 1.0 Introduction, Page 1, 3rd paragraph: The document states, "The facility has completed several phases of the RCRA Facilities Investigation (RFI) for the three surface water bodies ..." However, the historical data is not included in this document, as such it is unclear if the proposed sampling locations and intervals are sufficient. The document should be revised to include a more detailed discussion of sampling results (text, figure, table) from prior investigations so that we can evaluate if the proposed locations are adequate to sufficiently delineate the nature and extent of contamination in the waterbodies and along the adjacent shorelines.

Chevron Response

Sediment samples proposed in the November 2018 SFSAP and all sediment sample locations where additional sampling is proposed are shown on Figures 2, 2a, and 3, and are listed on Table 1. Both Table 1 and Figure 3 of the SFSAP provide an explanation for the proposed sampling location with respect to the USEPA's comments regarding the sufficiency of proposed sampling.

Tables I-IX of the SEER (Attachment 1) provide data on sediment contamination and physical properties from the 2014 sediment sampling event; mapped analytical results summaries for the targeted analytical parameters are provided on Figures 3-5 of the SEER. The SEER concluded the following regarding the extent of sediment in Woodbridge Creek:

- Based on the bathymetry, the Woodbridge Creek sediments terminate at the confluence of Woodbridge Creek and Arthur Kill.

This indicates that the physical limit of the contaminated (i.e., soft, upper sediments) does not extend into the Arthur Kill. In the upstream direction, (Attachment 1 [Figure 4]) samples collected north of the Spa Spring Creek/Woodbridge Creek confluence at SED-09-A, B, C, A(R), and C(R) suggest off-Facility contribution based on the significantly higher concentrations of BNs, EPH, and metals, versus the nearest on-Facility samples in Woodbridge Creek (SED-06A, B, and C) and in Spa Spring Creek (SED-07-A, B, and C). The SEER also notes that "background sources are a likely contributor to the presence of COPECs in sediment and in surface water in Woodbridge Creek and Spa Spring Creek." Chevron is proposing additional samples along two transects (SED-23-A, B, C and SED-24-A, B, C) between the SED-09 and SED-06 samples to refine the extent of contaminated sediments in this area (Figures 2, 2a).

USEPA Comment 2. Section 1.0 Introduction, Page 3: The document states, "As part of the Supplemental EE, Chevron ...further evaluated potential contaminant migration pathways to surface water." However, limited information on this evaluation was included in this document as such we are unable to determine if the proposed sampling program is adequate. The document, as well as Figure 2, should be revised to discuss, at length, any AOCs/SWMUs/PAOCs with the potential to impact these waterbodies, including but not limited to: SWMUs 1, 2, 3, 7, 8, 24, 26, 31, 35, 36, 40, 41, 45, etc. This figure should also show the former confluence of historic Spa Spring Creek with Woodbridge Creek and areas where non-point source discharges over the Facility's operation history may have occurred via sheet runoff or groundwater discharges, and/or were associated with overwater fuel transfers, former dock/pier operations, etc. Additionally, this figure should indicate the location of shoreline/perimeter soil borings where light non-aqueous phase liquid (LNAPL) was detected, as referenced below in Comment No. 9. The above information is necessary to determine if the proposed sampling program is adequate.

Chevron Response

Figure 2 has been revised to show the updated sampling locations, and Figure 2a has been added to the SFSAP to show the proposed sediment sampling locations with respect to the locations of SWMUs, AOCs, POACs, and current LNAPL areas along Spa Spring Creek, Woodbridge Creek, and the Arthur Kill, as well as other features such as known discharge locations to surface waters. The approximate length of Woodbridge Creek from the proposed sample locations at SED-19-B and 19-C nearest the Arthur Kill and upstream to sample locations SED-24-A, B, and C is 5,730 feet (~1.1 mile). On average, there is a sediment sampling transect for each ~500-foot segment of the creek along this distance, including the reach between State Street and the Spa Spring Creek

confluence. There is one sediment sampling transect for every 300 feet (on average) over the 2,200-foot length of Spa Spring Creek from its confluence with Woodbridge Creek upstream to Amboy Avenue. As noted at the September 2018 meeting, it was agreed that characterization of creek sediments to a finer degree was unnecessary for the purpose of the SFSAP, which is to ensure compliance with the HSWA permit. The proposed sampling frequencies adequately characterize the physico-chemical conditions in Spa Spring Creek and Woodbridge Creek as they flow past the Facility, and sample transects are situated as close as possible to SWMUs, AOCs, PAOCs, and LNAPL areas (current and former) on the Facility.

It should be noted that the proposed sediment sampling and analysis and the previously completed sampling likely capture impacts not associated with Chevron, given the industrial history of the watershed and active, urbanized land uses along its banks (e.g., CP Chemicals). Regarding the impact of non-point sources to the waterways, it was noted above that historical mapping in Appendix B indicates only very limited portions of the Facility generated overland flow, with the majority of process area drainage collected by stormwater infrastructure with permitted discharges at DSN004 and the Effluent Treatment Plant (Appendix B-1).

LNAPL areas at the Facility are shown on Figure 2a, and on Figures 3 and 4. The on-going remediation of these areas has significantly reduced their extent, and in some cases, LNAPL was eliminated entirely. LNAPL areas are further discussed in Section 2 to address USEPA's Comment 9. Historical data for LNAPL is provided in Appendix B-2 (Section 7 of the November 2003 RFI report). Additional data on LNAPL stabilization and monitoring through 2019 is provided in Appendices B-4 and B-5.

2.0 METHODS AND STUDY DESIGN

This section outlines the proposed sampling methods and laboratory analyses for the proposed sediment sampling. The SFSAP will be implemented in accordance with the NJDEP's *Technical Requirements for Facility Remediation* (TRSR), the NJDEP's *Ecological Evaluation Technical Guidance*, Version 2.0, August 2018 (EETG), and the NJDEP's 2005 *Field Sampling Procedures Manual* (FSPM). Details of sample collection, handling, and quality assurance are presented in the Quality Assurance Project Plan (QAPP) included as Appendix C. As noted above, the objective of the SFASP is to complete the RFI. The methods being employed to achieve this objective include supplementing the existing set of sediment data obtained from the sampling conducted in 2002 and 2014 with the data to be furnished from implementing the SFSAP. The sample locations, depth intervals and analytical parameters proposed herein are intended to be in accordance with the USEPA and NJDEP comments, and the technical discussion at the September 17, 2018 meeting. Where appropriate, the SFSAP has been modified to reflect the most recent USEPA/NJDEP comments provided in the March 1, 2019 letter, and the SFSAP is considered sufficient to complete the RFI for the HSWA permit.

The field sampling proposed in the SFSAP focuses on sediment sampling locations within Woodbridge Creek, Spa Spring Creek, and the Arthur Kill. Field activities to be performed as part of the SFSAP include:

- Sediment sampling, to be completed utilizing Vibracore® drilling methods from sampling barges or boats, where possible.
- Manual sediment sampling in some of the non-navigable reaches of the waterways or where buried utilities (e.g., pipelines) prevent use of mechanical drilling methods.
- Field observation, characterization, and screening of sediment samples for field indications of contamination including use of a photo-ionization detector (PID) to detect VOC vapors; field notes recording the presence of odors, staining, or sheen on the sediment core matrix; and,
- Laboratory analysis of sediment samples for analytical parameters similar to those analyzed in the 2002 and 2014 sediment investigations as presented in Section 2.2, below. Note that EPH did not exist as an approved petroleum hydrocarbon analytical method in 2002; sediment samples were analyzed for EPH during the 2014 sediment field investigation and EPH will be included among the analytical parameters proposed in this SFASP for this final phase of the investigation).

The results of the proposed investigation activities will be documented in a supplemental Woodbridge Creek, Spa Spring Creek and Arthur Kill RFI report. The supplemental report will be comprehensive, incorporating the results of the prior investigations for each of the subject waterways.

2.1 SAMPLE COLLECTION

The USEPA's Comment 4 of the March 1, 2019 letter requested that a table be prepared comparing historical and proposed sample information. Revised Table 1 provides a summary of all proposed samples to be collected and the associated laboratory analytical parameters along with correlated

historical sample information (depth, analyses) and an explanatory summary. The USEPA's Comment 5 discussed the proposed background sampling locations at SED-10, indicating that they were "directly beneath an overpass which is a potential source of PAHs and inorganics. Chevron recommended the SED-10 background sampling since the SED-09 samples located approximately 800 feet upstream of Spa Spring Creek and north of the Facility contained elevated levels of PAHs and EPH, possibly related to other sources. It should be noted that the USEPA's comment does not consider the urbanized nature of Woodbridge Creek and its surrounding watershed. Discounting a background sediment sample location due to potential roadway runoff impacts, given the intensity of industrial, residential, transportation and land use characteristics within the watershed is unrealistic. The map included as Attachment 3-1 is a NJDEP GIS-based Land Use and Land Cover map that provides an overview of conditions in the watershed. USEPA's Comment 5 indicated that off-Facility source sampling is needed to support Chevron's belief that contaminated sediment at SED-09 is unrelated to the Facility. As shown on Figures 9-7 , 9-8, and 9-9 of the 2003 RFI, samples at SED-06 downstream of SED-09 but upstream of the Facility contained much lower levels of contamination than SED-09 samples, which suggests a separate, off-Facility source. Chevron will re-evaluate this condition pending the results of sediment analysis at proposed sample locations along the SED-23 and SED-24 transects to further document sediment quality between the Facility and SED-09 (Figure 2; Figure 2a).

Samples will be collected from on-shore or from a boat that will navigate to each sediment location using Global Positioning System (GPS) equipment. To the extent possible, the sampling program will proceed in a direction, upstream or downstream, depending upon the tidal flow at the time of sampling. A total of up to 92 sediment samples will be collected for field screening and laboratory analysis. The locations of the proposed sediment samples are shown on revised Figure 2 and on Figure 2a, but it should be understood that final field sample locations and depths may be adjusted based on field conditions or safety concerns at the time of sampling.

The sampling locations shown on revised Figure 2 and Figure 2a, and on other drawings in this SFSAP were identified and discussed at the working session between Chevron, EPA, and NJDEP during the September 17, 2018 Facility meeting. A summary of the selection of sampling locations and analytical parameters can be found in Chevron's November 15, 2018 response letter to USEPA, accompanying this SFSAP (Appendix A). In summary the proposed sampling locations were selected to accomplish the following: (1) fill in data gaps with new sample locations, (2) provide additional background data as requested by USEPA so that USEPA's statistical background analysis as contained in the USEPA's ProUCL Guidance could be run, and (3) revisit previously sampled locations to supplement analysis with shallow and/or deeper samples as well as EPH where it had not previously been analyzed. The number and location of sediment samples proposed in the November 2018 edition of the SFSAP are similar to those proposed in this current revised edition. Eighty-seven (87) sediment samples were proposed in the November 2018 edition of the SFSAP, while the revised SFSAP added an additional five sediment samples for a total of 92 (see Table 1, revised). A summary of proposed sampling locations is provided below.

Additional Background Locations Woodbridge Creek: Chevron will collect eight (8) additional background samples along Woodbridge Creek, in the vicinity of existing background location SED-10, to provide a more robust background data set for analysis with USEPA's ProUCL method. These additional background locations for Woodbridge Creek are designated

as SED-WCBG-1 through SED-WCBG-8 on Figure 2 and Table 1. Sample depths and analytical parameters are provided on Table 1 with explanations relating proposed samples to the SWMUs/AOCs/PAOCs as appropriate.

Additional Background Locations Spa Spring Creek: Chevron will collect four (4) additional background samples along Spa Spring Creek to provide a more robust background data set for analysis with USEPA's ProUCL method comply. These additional background locations are designated as SED-SSBG-1 through SED-SSBG-4 on Figure 2 and Table 1. Sample depths and analytical parameters are provided on Table 1 with explanations relating proposed samples to the SWMUs/AOCs/PAOCs as appropriate.

Data Gaps Woodbridge Creek New Boring Locations: Chevron will add two additional transects (three borings per transect) in between SED-06 and SED-09. These additional transects are SED-23-A,B,C and SED-24-A,B,C as shown on Figure 2 and Table 1. Samples will be collected from the surface interval and from the subsurface interval exhibiting the greatest potential for contamination, determined by field observations.

Chevron will attempt to collect shallow sediment samples between existing transects SED-03 and SED-02. During the 2014 sampling event Chevron attempted to collect a Vibracore sample transect at this location. The pipeline companies which own and/or operate underground petroleum pipelines at this location refused to allow drilling access for safety reasons. Chevron will re-engage the underground utility owners and attempt to collect shallow samples along a transect using a Ponar or Ekman Dredge sampler. The feasibility of completing this transect depends on obtaining approval from the utility owners. This additional transect is SED-25, to include sample locations SED-25-A, B, and C. As requested in the USEPA's Comment 6, the proposed samples are included on Figure 2. Figure 2a, and Table 1 with the approximate alignment and location of utilities that cross Woodbridge Creek in the area of the proposed samples.

Chevron is also proposing an additional Woodbridge Creek transect between existing transects SED-01 and SED-02 even through this transect is not on or adjacent to Chevron property. This additional transect is SED-22-A, B, C as shown on Figure 2, Figure 2a, and Table 1. Sample depths and analytical parameters are provided on Table 1 with explanations relating proposed samples to the SWMUs/AOCs/PAOCs as appropriate.

Data Gap Samples EPH Analysis at Existing Boring Locations: As the USEPA noted in Comment 7 of their March 1, 2019 letter, "Chevron will resample all past locations on Woodbridge Creek and Spa Spring Creek for EPH analysis where EPH was not analyzed previously" but also indicated that the proposed EPH sampling is limited in scope to the 0-0.5-foot sediment interval. However, it should be noted that the proposed EPH sampling interval of 0-0.5 feet is consistent with Chevron's statement since that was the primary depth interval where EPH was not previously analyzed. The EPH-only sample locations are identified below and are listed on the revised Table 1 with comparison to prior samples Their locations are shown on Figures 2 and 2a.

Proposed Sample Location for EPH Analysis[1]

SED-01-A	SED-04-B	SED-07-C
SED-01-B	SED-04-C(R)	SED-08-A
SED-01-C	SED-05-A	SED-08-B
SED-02-A	SED-05-B	SED-09-A(R)
SED-02-B(R)	SED-05-C	SED-09-B
SED-02-C(R)	SED-06-A	SED-09-C(R)
SED-03-A	SED-06-B(R)	SED-10-A
SED-03-B(R)	SED-06-C	SED-10-B
SED-03-C(R)	SED-07-A	SED-10-C
SED-04-A	SED-07-B	

[1]Physical parameters including grain size, pH, and Total Organic Carbon (TOC) will also be analyzed at these locations.

Data Gap Additional Vertical Samples at Existing Boring Locations: During the 2014 investigation, only deeper samples were taken at boring locations SED-19-B and SED-19-C. Shallow samples to fill in this data gap will be taken at Sed-19-B and Sed-19-C. The two SED-19 samples are shown on revised Figure 2, Figure 2a, and Table 1. Both samples will be analyzed for the full suite of parameters (VOCs, BNs, metals), EPH. and the physical parameters as shown on Table 1 with explanations relating proposed samples to the SWMUs/AOCs/PAOCs as appropriate. The USEPA commented that "this section only discusses the collection of shallow samples at transect SED-19" and that the SFSAP should include additional sampling of a full suite of parameters at all sample locations "where data does not previously exist." The data gap for samples collected at transect SED-19 will be addressed by the proposed, shallow interval sampling since deeper intervals were already sampled and analyzed for the full suite of parameters along this transect (emphasis added).

2.1.1 Sediment Sampling

Where possible and consistent with 2014 sediment sampling in Woodbridge Creek, sediment cores will be advanced using Vibracore® drilling methods to refusal or a total depth of 20 feet below the sediment surface, or to the top of the underlying parent material (till, clay, or sand units), whichever is first encountered. Sediment physical conditions and related field observations (e.g., color, texture, consistency, odors, visual indication of petroleum hydrocarbons, etc.) will be recorded with the field notes. The sediment samples will be screened with a calibrated photo-ionization detector (PID) and measurements recorded.

The goal of this investigation is to supplement the data set generated from the 2002 and 2014 sampling events. Additional samples will be collected from the new transects; older locations will be revisited in Woodbridge Creek, Spa Spring Creek and the Arthur Kill; and samples will be collected from additional background locations in Woodbridge Creek and Spa Spring Creek. In response to the USEPA's Comment 9 regarding the consistent description of proposed sediment core intervals, all locations will be advanced to a total depth of up to 20 feet below the sediment

surface, or to the top of the underlying parent material (till, clay, or sand units), or refusal, whichever is first encountered. The depth limitations noted above, i.e., refusal, top of parent material (till…) would correspond with the physical (vertical) extent of soft sediment in the waterbodies. While a terminal depth of 20 feet is proposed, it may not be possible to attain in all locations. Refusal on hard till or other underlying parent material will likely be encountered at shallower intervals. The advancement of deeper borings is proposed only to enhance the lithology of the sediment materials, and not for additional collection of samples for laboratory analysis. While Vibracore® drilling is proposed for most sample collection, some sediment samples, including those between transects SED-02 and SED-03, will be collected manually from shallow intervals using a stainless steel Ponar dredge due to the presence of buried utilities or other hazards, subject to access being granted by the operators of the local utilities.

The USEPA indicated in Comment 9 of their March 1, 2019 letter that a proposed 10-foot limit to sediment borings may not be adequate for all locations based on its review of the existing boring logs for SWMU 40 (i.e. well and boring log for S40-7/U040-007, MW-33, U040-001, HP-0001-D, S40-7/U040-007, S40-8/U040-008, etc.). The USEPA specifically noted that "free/residual LNAPL" is present up to 26 feet below grade and is concerned that a 10-foot depth limitation may not adequately characterize potential impacts on creek sediments. The cited boring logs are included as Attachment 4, and were completed in the mid-1990s. As noted by the USEPA, the presence of potential LNAPL was noted to a depth of 26 feet in boring U040-007. However, it appears that the area of LNAPL is limited in extent. As described in the SEER (Attachment 1), *"there is no indication of ongoing discharges of hazardous substances from the Facility based on the soil and groundwater sample analysis, and light, non—aqueous phase liquid (LNAPL) investigation."* The LNAPL detected in the SWMUs has been demonstrated to be virtually immobile, and residual versus free and therefore does not represent a source of the contaminants detected in creek sediments. The existing (SED-03 A, B, and C) and proposed sediment sample locations are positioned in a manner where potential LNAPL/contaminants associated with SWMU 40 would be detected (Table 1; Figure 2a). There are two remaining LNAPL areas within 200 feet of the Arthur Kill in the East Yard including areas EY4a and EY4b. Boring logs associated with these are also included in Appendix B-4, which includes the entire *Third Quarter 2013 Progress Report, Former Chevron Perth Amboy Facility – 2012 and Q1/Q2 Stabilization Measures Report.* There is no known impact to the Arthur Kill associated with these small LNAPL areas, and the LNAPL is immobile/residual. Section 7 of the 2003 RFI report (Appendix B-2) describes the LNAPL at the Facility as follows:

The releases of LNAPL are believed to be fairly old, based on the Facility history and because most of the LNAPL is weathered. With a few exceptions, the accumulations of LNAPL in wells tend to be small, usually less than 0.1 feet. When the residual saturation of LNAPL is high enough (usually 20% of pore space or greater, based on the literature), the lower viscosity LNAPL will drain to a well. However, the lenses are often depleted rapidly. A typical example is the SWMU 40 LNAPL area. In 1995, based on the accumulation of LNAPL in temporary wells, Chevron began excavation for a recovery well and found the fill in the area to consist of predominantly clay. Although the excavation was completed to a depth of 12 feet, no LNAPL entered the excavation.

Although LNAPL will occasionally drain to a well, as described above, the LNAPL areas are not believed to be moving laterally because:

- *The LNAPL releases are old and the LNAPL has had time to stabilize;*
- *LNAPL is not found in continuous "pools" but in discontinuous lenses and layers of flyash surrounded by lower permeability material (i.e., clay);*
- *Many of the lenses and layers are below the water table;*
- *The accumulation of LNAPL in monitoring wells is typically small and therefore LNAPL "thickness" in the formation is small; and*
- *Much of the LNAPL has a high viscosity in the range of motor oil or greater.*

The additional weathering of the LNAPL over the past 16 years, coupled with active remediation have further reduced the extent of the LNAPL. Chevron has submitted annual LNAPL monitoring reports to the USEPA and NJDEP from the 1990s through 2017. These reports have been approved and indicate that no impacts to the adjacent waters are associated with the LNAPL areas. Monitoring wells in/near LNAPL areas were periodically gauged to determine LNAPL presence and thickness on the groundwater surface. Therefore, there is no further need to review historical soil boring logs for evaluating LNAPL.

2.2 SAMPLE ANALYSIS

The laboratory analytical parameters will generally match those from previous sediment sampling events conducted at the Facility in 2002 and 2014, as discussed during the September 2018 meeting. A summary of the proposed analytical methods for sediment samples is provided below:

Sediment Analytical Parameters

Parameter	**Method**
Volatile Organic Compounds (TCL)	USEPA 8260C
Base Neutral Compounds (TCL)	8270D/8270D-SIM
Metals (TAL)	6010C, 7471B
Extractable Petroleum Hydrocarbons (EPH)	NJDEP EPH Method Revision 3
Grain size determination	D1498-76M
Total Organic Carbon (TOC)	Lloyd-Khan

TAL = USEPA Target Analyte List; see QAPP for specific list of analytes.
TCL = USEPA Target Compound List; see QAPP for specific list of analytes.

The laboratory analysis of sediment samples will be performed by a NJDEP-certified laboratory. Quality assurance procedures for sampling, sample handling/preservation, and laboratory requirements are described in the QAPP (Appendix C).

All samples collected from the 0-0.5-foot interval below the sediment surface will be analyzed for EPH (total and fractionated), with other parameters included in selected samples as noted in Table 1, which includes other sample information.

3.0 DELIVERABLE

A supplemental sediment investigation report will be prepared providing the results of the field work and laboratory sample analyses conducted as part of this field effort. The supplemental report will be a comprehensive report on all three water bodies, combining the results of the 2002 and 2014 surface water/sediment investigations into a final waterbody RFI report intended to fully address the relevant provisions of Module III Condition B.2. (Pages 25 and 26) of the Facility's 2013 HSWA Permit. The USEPA had several comments, including Comment 10 regarding the proposed RFI report, pertaining to the need for historical data prior to completing the SFSAP review. Sediment analytical results data tables I-IX from the SEER (Attachment 1), and tables 9-7 to 9-11 from the BEE, Section 9 of the 2003 RFI (Appendix B-3), are included in the USEPA's Comment 10 and related comments regarding historical data for SWMUs/AOCs/LNAPL areas. As noted above, Appendix B contains relevant sections of key documents, and historical maps that provide an operational history of the Facility and an overview of the intensive industrial development of the area surrounding the Facility and the Woodbridge Creek watershed.

Similar to previous reports, sediment data obtained from this investigation will be screened against applicable ecological screening criteria (NJDEP's Ecological Screening Criteria [ESCs]). EPA's ProUCL software will be used to evaluate the expanded background data set to be obtained from Woodbridge Creek and Spa Spring Creek. The report will also incorporate the results of soil and groundwater data from adjacent SWMUs and AOCs. A review of the Facility's waste management practices as they potentially relate to the water bodies as well as relevant surrounding Facility history and land use will be provided. The type, nature, and extent of sediment contamination in the three water bodies will be provided in the report.

4.0 SCHEDULE

The proposed activities described in this workplan will be completed as follows, subject to timely EPA approval:

Pre-mobilization/mobilization:	1 Month Following Workplan Approval
Field sampling:	2 to 3 Months Following Workplan Approval
Laboratory testing and analysis:	3 to 4 Months Following Workplan Approval
Final Supplemental Sediment Report:	3 Months Following Receipt of Lab Data

Completion of field sampling and related activities will be conducted in accordance with safety protocols established by Chevron, and the anticipated schedule is subject to change based on operational conditions, weather, etc.

5.0 REFERENCES

New Jersey Department of Environmental Protection *Protocol for Addressing Extractable Petroleum Hydrocarbons* (Version 5.0). Facility Remediation Program. August 9, 2010.

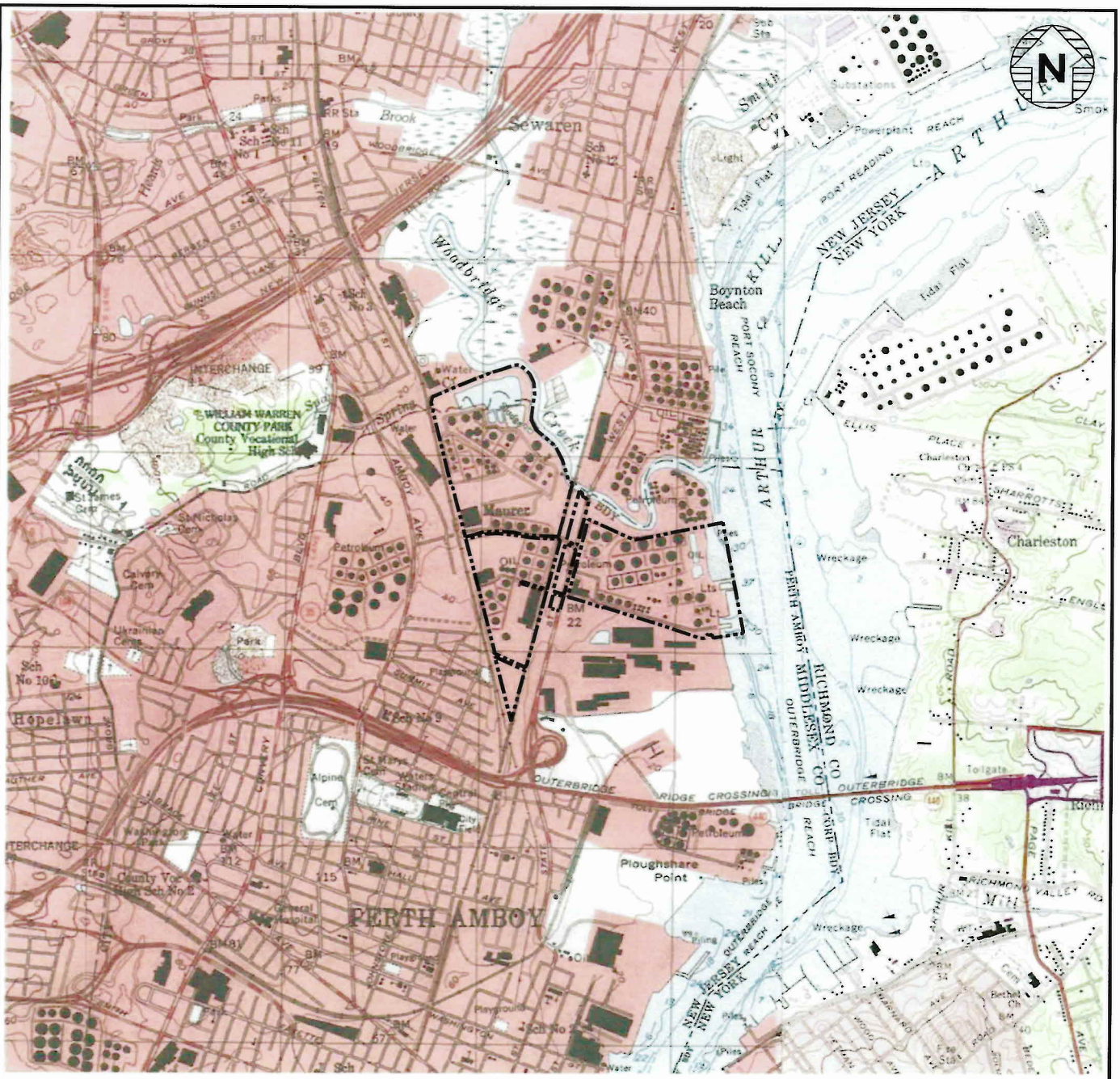
New Jersey Department of Environmental Protection *Extractable Petroleum Hydrocarbons Methodology*, Version 3.0. Facility Remediation Program. August 2010.

New Jersey Department of Environmental Protection. August 2018. *Ecological Evaluation Technical Guidance.* (Ver. 2.0)

New Jersey Department of Environmental Protection May 2012 *Technical Requirements for Facility Remediation.*

ALL OTHER DOCUMENTS REFERANCED IN THIS SFSAP ARE PROVIDED IN THE APPENDICES AND ATTACHMENTS.

FIGURES



SOURCE: PERTH AMBOY, N.J. QUADRANGLE, ARTHUR KILL, N.J. QUADRANGLE,
7.5 MINUTE SERIES (USGS TOPOGRAPHIC MAP)
HTTP://GOTO.ARCGISONLINE.COM/MAPS/USA_TOPO_MAPS

LEGEND

FORMER CHEVRON PERTH AMBOY FACILITY BOUNDARY

0 2500 FT.
APPROXIMATE SCALE

PROJECT:
CHEVRON FACILITY
PERTH AMBOY, NEW JERSEY

TITLE:
SITE LOCATION MAP

DRAWN BY:	M. GIAMBATTISTA	PROJ NO.:	194098
CHECKED BY:	T.REINOLD		
APPROVED BY:	T. REINOLD		**FIGURE 1**
DATE:	JULY 2019		

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FILE NO.: FIGURE 1.dwg